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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/822,521	04/12/2004	Jongsoo Jurng	8111-042-999	3333

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EXAMINER	
TAI, XIUYU	
ART UNIT	**PAPER NUMBER**
4151	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/822,521	JURNG ET AL.	
	Examiner	Art Unit	
	Xiuyu Tai	4151	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 April 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *8/30/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-3, and 5 are rejected under 35 U.S.C. 102(b) as being anticipated by Vander Wal (COMBUSTION AND FLAME 130:37- 47 (2002)).

3. For claim 1, Vander Wal demonstrates an experimental apparatus for carbon nanotube synthesis with a flame environment, including: a reaction gas supplier for supplying a reaction gas in isolation from atmospheric condition (reference "Reactant gases" in Figure 1); a metallic catalyst supplier for supplying a metallic catalyst in isolation from atmospheric condition (reference "Nebulizer" in Figure 1); a reactor communicating with the reaction gas supplier and the metallic catalyst supplier and providing a space for synthesis of the carbon nano-material (reference. "Sample introduction line" in Figure 1; "a central fuel tube" in the second paragraph in ESPERIMENTAL section on page 39); a heating means, positioned outside the reactor, for heating the reactor to a temperature proper for the synthesis of the carbon nano-material ("a water cooled McKenna burner" in the second paragraph in EXPERIMENTAL section on page 39); and a collecting means for collecting the carbon nano-material generated in the reactor (reference "Thermophoritic Probe" in Figure 1; see also the third paragraph in EXPERIMENTAL section on page 39).

4. For claim 2, Vander Wal uses carbon monoxide, acetylene, and ethylene as carbon supply source (see the second paragraph in EXPERIMENTA section on page 39; RESULTS AND DISCUSSION section on page 43), which are within the claimed reaction gas.

5 For claim 3, Vander Wal uses ferric nitrate as a catalyst in the experiment (see the first paragraph in EXPERIMENTAL section on page 38), which is metal nitrate.

6. For claim 5, Vander Wal uses a water-cooled McKenna burner as a heating means (see the second paragraph n EXPERIMENTAL section on page 39), which is a surface flame burner.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vander Wal (COMBUSTION AND FLAME 130:37-47 (2002)) in view of Adderton et al (U.S.Pub.2004/0037767).

10 For claim 4, Vander Wal fails to use a reactor tube made of quartz. However, Adderton et al teaches a quartz tube in an apparatus of carbon nanotube fabrication (reference 18 in Figure 1; see also paragraph [0031] on page 3). The use of quartz tube is known in the art for synthesis of carbon nanotubes since quartz is resistant to high temperature. Therefore, it would be obvious for one having ordinary skill in the art to modify Vander Wal's apparatus by adding a quartz tube to withstand high temperature of flame during synthesis of carbon nanotubes.

11. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vander Wal (COMBUSTION AND FLAME 130:37-47 (2002)) in view of Chen et al (U.S. 2005/0109280).

12. For claim 6, Vander Wal fails to disclose a reflector. However, Chen et al teaches a carbon nanotube fabricating system that comprises a reflector (reference 80 in Figure 4; see paragraph [0051]. It would be obvious for one having ordinary skill in the art to modify Vander Wal's device by using a reflector to increase heating efficiency.

13. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vander Wal (COMBUSTION AND FLAME 130:37-47 (2002)) in view of Hahn et al (CARBON 42 (2004) 877-883).

14. For claim 7, Vander Wal fails to disclose a reactor extending in a helical form. However, Hahn et al teaches a helical-type extension reactor (see Abstract on page

877; reference "Helical extension reactor" in Figure 1; EXPERIMENTAL section on page 878) in synthesis of carbon nanotubes. As taught by Hahn et al, attaching a helical-type extension reactor increases the yield of carbon nanotubes (see EXPERIMENTAL section on page 878). Therefore, it would be obvious for one having ordinary skill in the art to extend the reactor in Vander Wal's device to a helical form to increase the yield of carbon nanotubes in the teaching of Hahn et al. As indicated by Hahn et al, an extension reactor can only provide an additional growth region (see the fifth paragraph in Results and discussion section on page 879 of Hahn et al). Regarding claim 8, it is noted that the instant disclosure does not provide any criticality with regard to zigzag form of the reactor. Therefore, the reactor extending in a zigzag form is a matter of choice, which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed shape is significant.

15. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vander Wal (COMBUSTION AND FLAME 130:37-47 (2002)) in view of Wintermute (U.S.2, 698,669) and Kodas et al (U.S. 2004/0072683)

16. For claim 9, Vander Wal fails to teach a collecting means comprising a charging unit and a separation unit. It should be noted that a collecting means comprising a charging unit and a separation unit is known as an electrostatic precipitator in the art. Wintermute teaches an electrostatic precipitator including a charging zone and a precipitating zone (see col.1, line 19-24; claim 1). Moreover, Kodas et al discloses a collection method using an electrostatic precipitator (see paragraph [0130] on page 9) for producing carbon composite electrocatalyst powder. Therefore, it would be obvious

for one having ordinary skill in the art to substitute a thermophoretic collecting technique in Vander Wal's device with a collecting means comprising a charging unit and a separation unit (i.e. an electrostatic precipitator) to simplify the Vander Wal's apparatus.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Xiuyu Tai whose telephone number is 571-270-1855. The examiner can normally be reached on Monday - Friday, 7:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mikhail Kornakov can be reached on 571-272-1303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Xiuyu Tai

10/18/2007

MICHAEL KORNAKOV
PRIMARY EXAMINER

11/08/07